



**PROPOSED DEVELOPMENT OF THE 132kV KAREEBOSCH
POWERLINE (BON ESPIRANGE SUBSTATION TO
KOMSBERG SUBSTATION), NORTHERN CAPE PROVINCE**

DESKTOP GEOTECHNICAL REPORT

NOVEMBER 2021

REVISION 01



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PROPOSED DEVELOPMENT OF THE 132KV POWERLINE, NORTHERN CAPE PROVINCE

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SYNOPSIS
Desktop geotechnical investigation for the proposed Kareebosch 132kV powerline.




KEY WORDS:
Powerline, Sandstone, Shale, Foundations, Subsoil Removal, Shallow Bedrock, Resistivity.

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QUALITY VERIFICATION

This report has been prepared under the controls established by a quality management system that meets the requirements of ISO 9001: 2015 which has been independently certified by DEKRA Certification.



Verification	Capacity	Name	Signature	Date
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National Environmental Management Act, 1998 (Act No. 107 of 1998) and Environmental Impact Regulations 2014 (as amended) Requirements for Specialist Reports (Appendix 6)

Section in EIA Regulations 2014 (as amended)	Clause	Section in Report	
Appendix 6	(1)	A specialist report prepared in terms of these Regulations must contain —	
	(a)	details of –	
		(i) the specialist who prepared the report; and	Verification Page
		(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae.	Appendix C
	(b)	A declaration that the person is independent in a form as may be specified by the competent authority;	Appendix C
	(c)	An indication of the scope of, and the purpose for which, the report was prepared;	1
	(cA)	An indication of the quality and age of base data used for the specialist report;	4, 5, 6, 10
	(cB)	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Table 8-1
	(d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	N/A
	(e)	A description of the methodology adopted in preparing the report or carrying out the specialised process; inclusive of equipment and modelling used;	1
	(f)	Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Appendix A Map 1,2,3,4, 5,6
	(g)	An indication of any areas to be avoided, including buffers;	Appendix A Map 1,2,3,4,5,6
	(h)	A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Appendix A Map 1,2,3,4,5
	(i)	A description of any assumptions made and any uncertainties or gaps in knowledge;	2
	(j)	A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment or activities;	3, 4, 5, 6, 7
	(k)	Any mitigation measures for inclusion in the EMPr;	8
	(l)	Any conditions for inclusion in the environmental authorization;	8
	(m)	Any monitoring requirements for inclusion in the EMPr or environmental authorization;	8
	(n)	A reasoned opinion –	
		(i) as to whether the proposed activity, activities or portions thereof should be authorized;	9
	(iA) regarding the acceptability of the proposed activity or activities; and	9	
	(ii) if the opinion is that the proposed activity, activities or portions thereof should be authorized, any avoidance, management and mitigation measures	8	

		that should be included in the EMPr, and where applicable, the closure plan;	
	(o)	A description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
	(p)	A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	None
	(q)	Any other information requested by the authority.	N/A
	(2)	Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A

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DESKTOP GEOTECHNICAL REPORT

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EXECUTIVE SUMMARY

This report presents the findings concluded from a desktop level study for the proposed 6.0km 132kV Kareebosch powerline (Bon Espirange Substation to the Komsberg Substation). The study area receives a relatively low mean annual precipitation of 264mm, with the warmest months being January and February. Various tributaries of the Tankwa and the Wilgebos River drain the study area. The study area is underlain by rock units of the Abrahamskraal (Pa) Formation which forms part of the Beaufort Group. The Beaufort Group forms part of the greater Karoo Supergroup.

Competent founding conditions are anticipated in the relatively shallow, slightly weathered bedrock, which will have to be assessed during the detailed investigation stage prior to construction. Colluvial deposits can be anticipated along hillslopes with alluvial deposits anticipated near drainage features. Four-fold features were identified in the study area. Regional borehole data indicates relatively low aquifer yields in the range of 0.1-0.5l/s. Based upon preliminary geological and geotechnical assessments; the desktop study indicates no fatal flaws. The impact of the development from a geotechnical perspective will be restricted to the removal and displacement of soil, boulders and bedrock. Based on the impact assessment matrix undertaken for this project, from a geotechnical perspective the impact of the power line was found to be **“Negative moderate impact - The anticipated impact will have negative effects and will require mitigation.”** Based on the desktop study, the site is considered suitable for the proposed construction of the powerline.

PROPOSED DEVELOPMENT OF THE 132KV KAREEBOSCH POWERLINE (BON ESPIRANGE SUBSTATION TO KOMSBERG SUBSTATION), NORTHERN CAPE PROVINCE

DESKTOP GEOTECHNICAL REPORT

1 INTRODUCTION

This report presents the findings of a desktop level study undertaken by JG Afrika (Pty) Ltd, for the proposed 132kV Kareebosch powerline (Bon Espirange Substation to the Komsberg Substation). The powerline is approximately 6.0km long. It is understood that a desktop level geotechnical report is required to supplement an environmental submission for a Basic Assessment (BA) report being undertaken by WSP. The project is situated north of the town of Matjiesfontein in the Karoo Hoogland Local Municipality and the Laingsburg Local. The 132kV overhead power line will connect the Komsberg substation to Bon Espirange substation.

The overhead powerline will be a 132kV steel single or double structure with kingbird conductor (between 15 and 20m in height – above ground level). Standard overhead line construction methodology will be employed – drill holes (typically 2 – 3m in depth), plant poles, string conductor. It is not envisaged that any large excavations and stabilized backfill will be required however this will only be verified on site once the Geotech has been undertaken at each pole position (part of construction works).

1.1 Scope of works

The investigation seeks to give a desktop evaluation of the proposed study site. The objectives of the study were to assess the geological and geotechnical conditions along the powerline route.

The desktop study involved a literature review and a review of topographic and geological maps. Consideration was given to, but not limited to the following from a desktop level:

- The influence of topography on site suitability.
- The envisaged geological and geotechnical influences on the competency of foundations for the construction of structures.
- Tectonic influences on overall stability, namely the presence of faulting, lineaments and preferred discontinuity orientations.
- Comments regarding likely founding conditions, geotechnical constraints, problem areas and overall site stability from a desktop level.
- Recommendations regarding requirements for subsequent detailed geotechnical investigations.

1.2 Terms of Reference

The appointment to proceed with the investigation is based upon JG Afrika's cost estimate entitled, "Quotation for Geotechnical Desktop Study for the Proposed Kareebosch 132kv Powerline, Western Cape" dated the 28th of April 2021. JG Afrika received the appointment via a sub-consultancy agreement letter referenced, 4110343-D03, via email on the 20th of July 2021.

1.3 Specialist Credentials

Ms. Bulala is a qualified engineering geologist, having attained a Bachelor of Science Degree in Geology, from the University of Limpopo. She is registered as a Candidate Natural Scientist (Registration No. 116482). Ms. Bulala holds the position of Engineering Geologist at JG Afrika's Pietermaritzburg branch. She has experience in various fields of earth science and ground engineering, namely: engineering geology, geotechnical engineering, environmental geology and soil surveys. At present Ms. Bulala specializes in conducting foundation investigations and material investigations for dams, roads and renewable energy.

The report was reviewed by Mr. Tom Speirs. Mr Speirs is a qualified senior engineering geologist with over 30 years' experience. He is a registered Professional Natural Scientist (Registration No. 400104/94) in the geological sciences field. He has undertaken geotechnical, geological and materials work throughout Southern Africa, East, West and Central Africa, Madagascar and eastern Australia. He has accumulated extensive experience, including in renewable energy projects in South Africa.

1.4 Assessment Methodology

The methodology entailed a literature review and a review of topographic and geological maps. Consideration was given to the terrain, geological, hydrogeology as well as expected geotechnical constraints.

2 ASSUMPTIONS, LIMITATIONS, UNCERTAINTIES - DISCLAIMER

The interpretation of the overall geotechnical conditions across the site is based upon a review of available information on the project area. Subsurface and geotechnical conditions have been inferred at a desktop level from available information, experience in the project area and professional judgement. The information and interpretations are given as a guideline only and there is no guarantee that the information given is totally representative of the entire area in every respect. No responsibility will be accepted for consequences arising out of the fact that actual conditions vary from those inferred. The information must be verified by the undertaking of a detailed geotechnical site investigation.

3 SITE DESCRIPTION

3.1 Locality

The site lies within the Komsberg Renewable Energy Development Zone (REDZ) located within the Cape Winelands District Municipality and the Karoo Hoogland District Municipality.

A Locality Plan indicating the site location is presented as **Map 1** which is included in **Appendix A**.

JG Afrika has previous experience in the study area having conducted detailed geotechnical investigations for the Oya energy facility in 2020 and the Roggeveld Windfarm development in 2015. The Roggeveld Windfarm development site location overlaps the proposed Rietkloof powerline route. The Roggeveld project comprised fifty-six proposed wind turbines located near District Road 2243. The Oya project is located 18km west of the powerline route and comprised a solar photovoltaic facility and twelve wind turbines.

JG Afrika also conducted a previous detailed geotechnical investigation for the stabilisation of the Verlatekloof Pass (2008) 25km from the study area.

3.2 Land Use and Vegetation

The proposed powerline is approximately 6.0km in length.

The regional biome within which the study site is located is classed as a Succulent Karoo Biome, with the presence of lowland succulent Karoo vegetation species.

A Site Plan indicating the layout of the powerline route is presented as **Map 2** which is included in **Appendix A**.

3.3 Climate

The study area is characterized by a dry climate with a “BWk” classification according to the Köppen-Geiger climate classification. Matjiesfontein receives a relatively low mean annual precipitation of 264 mm. The average lowest rainfall is received in September (14 mm) and the highest in March (27 mm), which is a seasonal variation of 14 mm.

The maximum midday temperatures for Matjiesfontein ranges from 30°C in January and February to 15.2°C in July. The minimum temperatures for Matjiesfontein ranges from 14.4°C in February to 3.8°C in July. The average temperatures vary during the year by 12.3°C. Table 3-1, summarizes the climatic conditions.

Table 3-1: Summary of Climatic Conditions, Matjiesfontein (information extracted from “Climate-Data.org”)

Months	Average Rainfall (mm)	Temperature (°C)		
		Maximum	Minimum	Average
January	16	30.1	14	21.3
February	16	30.0	14.4	21.4
March	27	27.3	12.9	19.5
April	24	23.1	10.1	16.3
May	22	19.2	7.3	12.9

Months	Average Rainfall (mm)	Temperature (°C)		
		Maximum	Minimum	Average
June	25	15.3	4.3	9.4
July	23	15.2	3.8	9.1
August	23	16.5	4.3	10.1
September	14	19.9	6.1	12.7
October	23	23.7	8.7	15.8
November	28	25.9	10.4	17.7
December	23	28.6	12.7	20

3.4 Drainage and Topography

The study area is drained by non-perennial tributaries of Tankwa River, Wilgebos River and an unnamed River. The tributaries form dendritic drainage patterns. The Tankwa River buffers the northern and the cuts across the central part of the site. The powerline crosses an unnamed perennial river south of the site. The Wilgebos River falls outside of the energy development zone.

Slope aspect and drainage features are presented in **Map 3.1 and Map 3.2** which is included in **Appendix A**.

The slope gradient map indicates that the southern portion of the powerline is characterised by flat to gentle terrain (0° – 2.3° and 2.3° – 5.5° slopes). The majority of the powerline route is characterised by gentle to steep terrain (5.5° – 17.3° slopes). The slope gradient map indicates isolated areas of steep, mountainous terrain ($>21^{\circ}$ slopes) in the valleys of the study site. Spot heights indicate elevation values of 1353m above mean sea level.

The slope aspect map further highlights the relief difference with elevation values ranging between 900-1100 metres above sea level in the central portion of the site.

4 GEOLOGY

According to the 1: 250 000 Geological Map (3220) of Sutherland published by the Council for Geoscience, the study area is underlain by rock units of the Abrahamskraal (Pa) Formation which forms part of the Adelaide Subgroup, forming part of the Beaufort Group. The Beaufort Groups forms part of the greater Karoo Supergroup.

The Abrahamskraal Formation (Pa) is represented by grey and green mudstone, siltstone and subordinate sandstone. Thin chert beds are common on the lowermost red mudstones of the Abrahamskraal Formation.

Regional measurements indicate that the rock units dip 270° in a westerly direction, 07° in a northerly direction and 315° in a north westerly direction.

The sedimentary rocks in the area have been acted upon by numerous tectonic forces resulting in fold structures. Based upon the geology map, four fold features are located within the study area. The fold axes trend in an E-W direction and represent localized synclines and anticlines which form part of the Cape Fold Belts.

A Geological Map is presented as **Map 4** which is included in **Appendix A**.

5 HYDROGEOLOGY

The northern portion of the study area lies within the E23A catchment area which receives a mean annual precipitation of 254mm. The southern portion lies within the J11D catchment area which receives a mean annual precipitation of 240mm.

According to the 1: 3 000 000 scaled Groundwater Harvest Potential Map of South Africa, Regional yields of sustainable groundwater abstraction rates, indicate that the study area lies in areas with values of 6000 - 10 000 m³/km²/annually and 10 000 – 15 000 m³/km²/annually.

Regional hydrogeological data indicate the aquifer type is classed as 'b2' which is a, fractured aquifer type. Regional borehole data indicate relatively low yields, estimated to be in the range of 0.1-0.5 l/s. Fractured aquifers (designation b) form as a result of discontinuities, such as faults, fractures and joints, in hard bedrock. These form the primary porosity conduits in which groundwater moves.

An extract of the regional Hydrogeological Map is presented as **Map 5** which is included in **Appendix A**.

The structural geology in the study area is conducive to the formation of high-yielding aquifer formations. As such a detailed hydrogeological investigation for the proposed borehole water abstraction works, is recommended during the detailed design phase.

6 ENGINEERING GEOLOGY

The engineering geology refers to the engineering characteristics of natural earth material for founding structures and suitability for construction material purposes.

The study area is characterized by a Weinert N value of more than 10, meaning that the type of weathering is primarily by mechanical disintegration. Shallow residual soils are commonly granular and gravelly (Brink, 1983).

The study area is dominated by the Abrahamskraal Formation. Colluvial deposits can be anticipated along hillslopes with alluvial deposits anticipated near drainage features.

Based on previous investigations in the greater Roggeveld area, blocky, greyish-red mudstone with interbedded grey very fine to medium-grained quartzofeldspathic sandstone can be anticipated.

Weathered, limestone layers of up to 1.5m in thickness may be present. Greenish-grey cherty layers, of a few centimetres to two metres thickness, may also be present in the Abrahamskraal formation. The chert and limestone layers possess potentially soluble properties.

Where material is required for the construction of roads and laydown areas, natural gravely or crushed sandstone bedrock can potentially be a suitable source. Consideration must be given to the presence of excessive pyrite and muscovite which can cause distress where sandstone is used as basecourse (Brink, 1983). In addition, where chemical stabilization is required the clay matrix of sandstones make them suitable for stabilization with lime (Brink, 1983). The occurrence, nature, material quality and quantity of sandstone and other potential construction material will have to be assessed during the detailed geotechnical investigation.

Mudrocks such as siltstone, mudstone and “mud-shales” are not considered suitable for use as construction material, due to their swelling characteristics, excessive absorption of water, poor engineering performance and lack of durability. Slope stability issues can arise in areas where closely intercalated sandstones and mudrock exist. When mudrocks slake or disintegrate the exposed sandstone layers are undercut, this can result in rockfalls (Brink, 1983). Based on previous investigations in the Roggeveld area, concave cave structures can be anticipated through erosion of the less-competent shale and mudstone bedrock beneath the hard sandstone beds when exposed to the elements.

Based on previous investigations in the Sutherland area (Verlatekloof Pass), the Abrahamskraal Formation is represented by maroon mudstone, greenish grey siltstone and olive grey sandstone. These sedimentary units are intercalated and display variable weathering, as described for the Formation.

7 GEOTECHNICAL APPRAISAL

Competent founding conditions for the powerline pylons are anticipated at relatively shallow depths in slightly weathered bedrock, which will have to be assessed during the detailed investigation stage of the project prior to construction.

Consideration can be given to the following foundation type for the pylons:

- Drilled shaft/bored piles – these foundations are suitable in areas where shallow bedrock conditions are encountered or in poor, non-cohesive soils, where helical or screw-in piles are not suitable. The advantages of drilled shafts are they can support high loads, they have minimal settlement and deformation and minimum excavation during construction.

The proposed two substation sites are underlain by the Abrahamskraal Formation. The sites lie on gentle slopes of 2.3-5.5° likely to be shallow transported soils. The two sites do not traverse any drainage features. Consideration can be given to the following foundation types for the substation:

- Normal strip footings

- Spread footings

It is important to select the correct foundation type and optimize the design, as such a detailed and comprehensive geotechnical investigation is required this will be undertaken prior to construction and upon finalisation of the layout plan.

The presence of uplift and downward forces in the form of wind loads must be taken into consideration during foundation design.

8 GEOTECHNICAL IMPACT ASSESSMENT

From a preliminary geological and geotechnical assessment, no fatal flaws have been identified.

8.1 Impact of the Project on the Geological Environment

The Karoo Supergroup is known for its fossil bearing sedimentary units which will have to be more accurately assessed by a palaeontologist. The removal of rock which contain these fossils will result in the destruction of these fossils.

The impact of the development from a geotechnical perspective will be restricted to the removal and displacement of soil, boulders and bedrock referred to in this report as “subsoils”. The levelling of areas to create building platforms for the substation will also result in the displacement and exposure of subsoils. The potential impact of the development on the terrain and geological environment, will be the increased potential for soil erosion, caused by construction activities and the removal of vegetation.

These impacts will have a negative visual impact on the environment, which in some cases can be remediated. Protected areas must be identified prior to construction. Temporary berms must be constructed, and surface water must be diverted into drainage channels. Construction must make use of existing road network and access tracks. Rehabilitation of affected areas (such as regrassing, mechanical stabilization) must be implemented. The correct engineering design and construction of gravel roads over water crossings must be applied. Correct construction methods for foundation installations and cut to fill configurations.

The powerline route is considered suitable for construction provided that recommendations presented in this report are adhered to.

Based on the impact assessment matrix undertaken for this project, from a geotechnical perspective the impact of the power line was found to be **“Negative moderate impact - The anticipated impact will have negative effects and will require mitigation.”** The assessment impact assessment matrix is presented overleaf as Table 8-1. The impact assessment criteria developed by WSP is included in Appendix B.

Table 8-1: Geotechnical Impact Assessment Matrix

Project Name		Proposed Development of the 132kV Kareebosch Powerline																	
CONSTRUCTION																			
Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation					Post-Mitigation								
						(M+)	E+	R+	D)x	P=	S	Rating	(M+)	E+	R+	D)x	P=	S	Rating
Impact 1:	Subsoil Removal	Increase Soil Erosion	Construction	Negative	Moderate	3	1	3	3	5	50	N3	2	1	1	2	2	12	N1
						N3 - Moderate					N1 - Very Low								
OPERATIONAL																			
Impact number	Receptor	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation					Post-Mitigation								
						(M+)	E+	R+	D)x	P=	S	Rating	(M+)	E+	R+	D)x	P=	S	
Impact 1:	Subsoil Removal	Increase Soil Erosion	Operational	Negative	Moderate	1	1	3	4	3	27	N2	1	1	1	4	2	14	N1
						N2 - Low					N1 - Very Low								
DECOMMISSIONING																			
Impact number	Receptor	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation					Post-Mitigation								
						(M+)	E+	R+	D)x	P=	S	Rating	(M+)	E+	R+	D)x	P=	S	
Impact 1:	Subsoil Removal	Increase Soil Erosion	Decommissioning	Negative	Moderate	4	1	3	2	4	40	N3	2	1	1	2	2	12	N1
						N3 - Moderate					N1 - Very Low								
CUMULATIVE																			
Impact number	Receptor	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation					Post-Mitigation								
						(M+)	E+	R+	D)x	P=	S	Rating	(M+)	E+	R+	D)x	P=	S	
Impact 1:	Subsoil Removal	Increase Soil Erosion	Cumulative	Negative	Moderate	3	1	3	4	5	55	N3	1	1	1	4	2	14	N1
						N3 - Moderate					N1 - Very Low								

9 GEOTECHNICAL COMPARATIVE ASSESSMENT OF ALTERNATIVES

No layout alternatives were considered and assessed as part of this geotechnical report. The alignment is as shown in Map 2 (Appendix A) and are described below:

No fatal geotechnical constraints have been identified, which rendered the powerline or substation site to be non-suitable.

Construction activities on steeply inclined slopes will require additional earthworks, longer access routes in comparison to lower topographic areas. Slope stability issues can arise in steeply inclined terrain which will require retention structures and advanced foundations. Mountainous terrain will require earthworks to create level platforms for structures.

10 CONCLUSIONS AND RECOMMENDATIONS

The foregoing report presents the findings concluded from a desktop study undertaken for the proposed 6.0km powerline. The 132kV overhead power line will connect the Komsberg substation to the Bon Espirange substation. The powerline route is anticipated to be underlain by shallow bedrock conditions.

The impact of the powerline was found to be **“Negative moderate impact - The anticipated impact will have negative effects and will require mitigation.”** ‘

No fatal geotechnical constraints, which rendered the powerline or substation site to be non-suitable, have been identified during this desktop study. Conclusions presented in this report will have to be more accurately confirmed during the detailed geotechnical investigation phase.

It recommended that a detailed geotechnical investigation be undertaken during the detailed design phase of the project. The detailed geotechnical investigation must entail the following:

- Profiling and sampling of exploratory trial pits to determine founding conditions for the pylons.
- Thermal resistivity and electrical resistivity geophysical testing for electrical design and ground earthing requirements.
- Groundwater sampling of existing boreholes to establish a baseline of the groundwater quality for construction purposes.

11 REFERENCES

- Brink. A.B.A (1983). Engineering Geology of Southern Africa: The Karoo Sequence. Volume 3. Building Publications: Cape Town.
- Climatic Data, Matjiesfontein. Accessed July 2021 from: <https://en.climate-data.org/>

- Singh. K. (2020). Solar photovoltaic (PV) and wind turbine infrastructure, Matjiesfontein, western cape province geotechnical investigation. JG Afrika (Pty) Ltd.
- Hayes. T. (2015). Geotechnical Investigation for the proposed Roggeveld Windfarm site. Jeffares & Green, Port Elizabeth. JG Afrika (Pty) Ltd.
- Speirs. T. (2008). Geotechnical Assessment of Instability of Verlatekloof Pass. Jeffares & Green, Pietermaritzburg.
- 1: 250 000 Geological Map Series (3220 Sutherland). Published by the Council of Geoscience.
- 1: 3 000 000 Groundwater Harvest Potential of the Republic of South Africa. Published by the Department of Water Affairs and Forestry.

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Appendix A: Figures

KAREEBOSCH 132KV POWERLINE GEOTECHNICAL DESKTOP STUDY: LOCALITY MAP 2: BON ESPIRANGE SUBSTATION TO KOMSBERG SUBSTATION [APPLICANT: RED ROCKET SOUTH AFRICA (PTY) LTD]



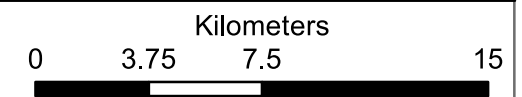
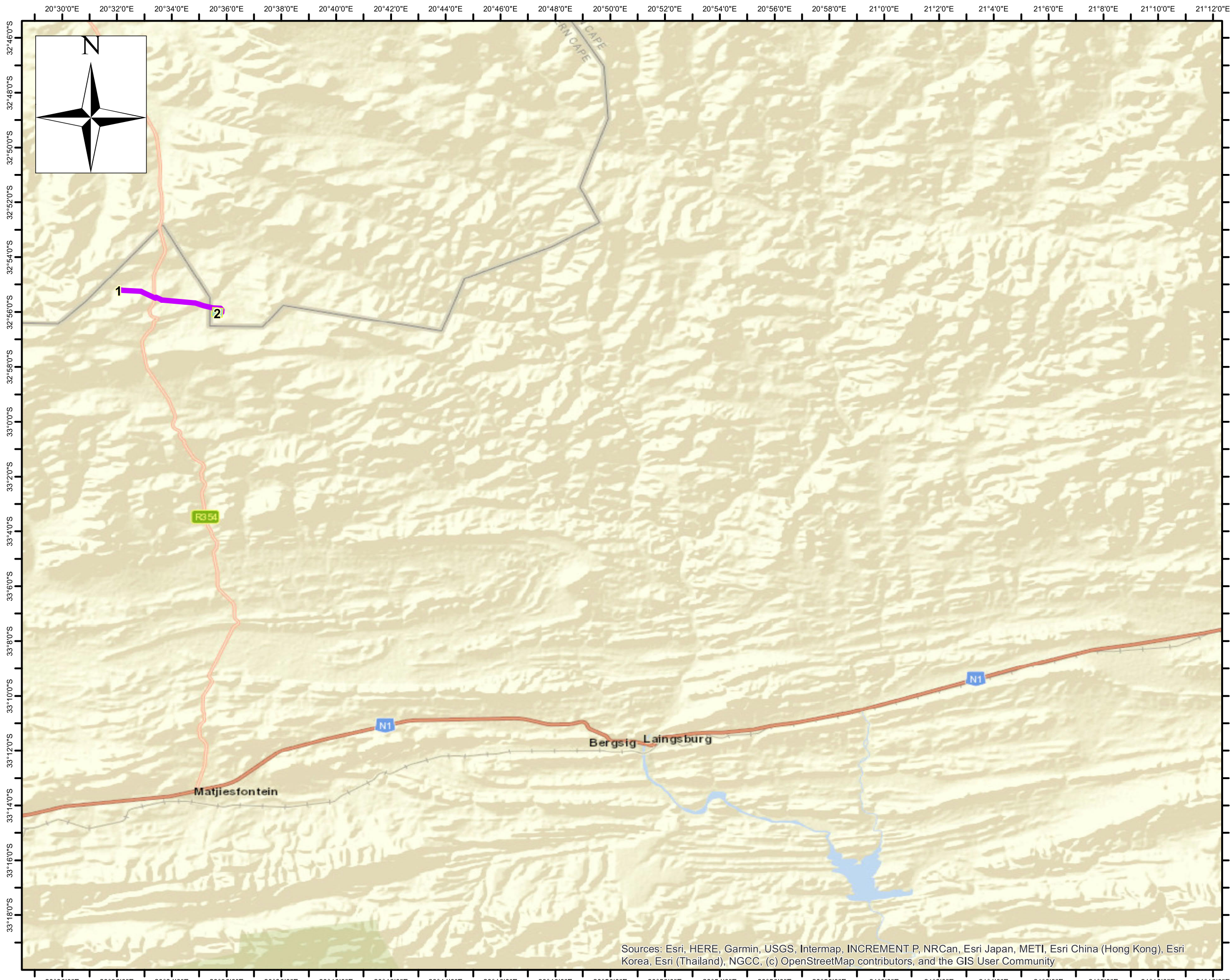
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Legend

Substations

- (1) Bon Esprange Substation
- (2) Komsberg Substation
- Bon Esprange to Komsberg Powerline



Map No.: 02	Scale (A3): 1:250 600
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Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Designed and detailed under the controls established by our quality management system that meet the requirements of ISO 9001:2000 which has been independently certified by DEKRA Certification under certificate number 90906882.

**KAREEBOSCH 132KV POWERLINE GEOTECHNICAL DESKTOP STUDY:
SITE MAP (MAP 4): BON ESPIRANGE SUBSTATION TO KOMSBERG SUBSTATION [APPLICANT: RED ROCKET SOUTH AFRICA (PTY) LTD]**



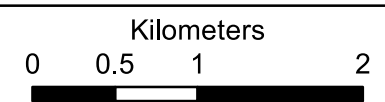
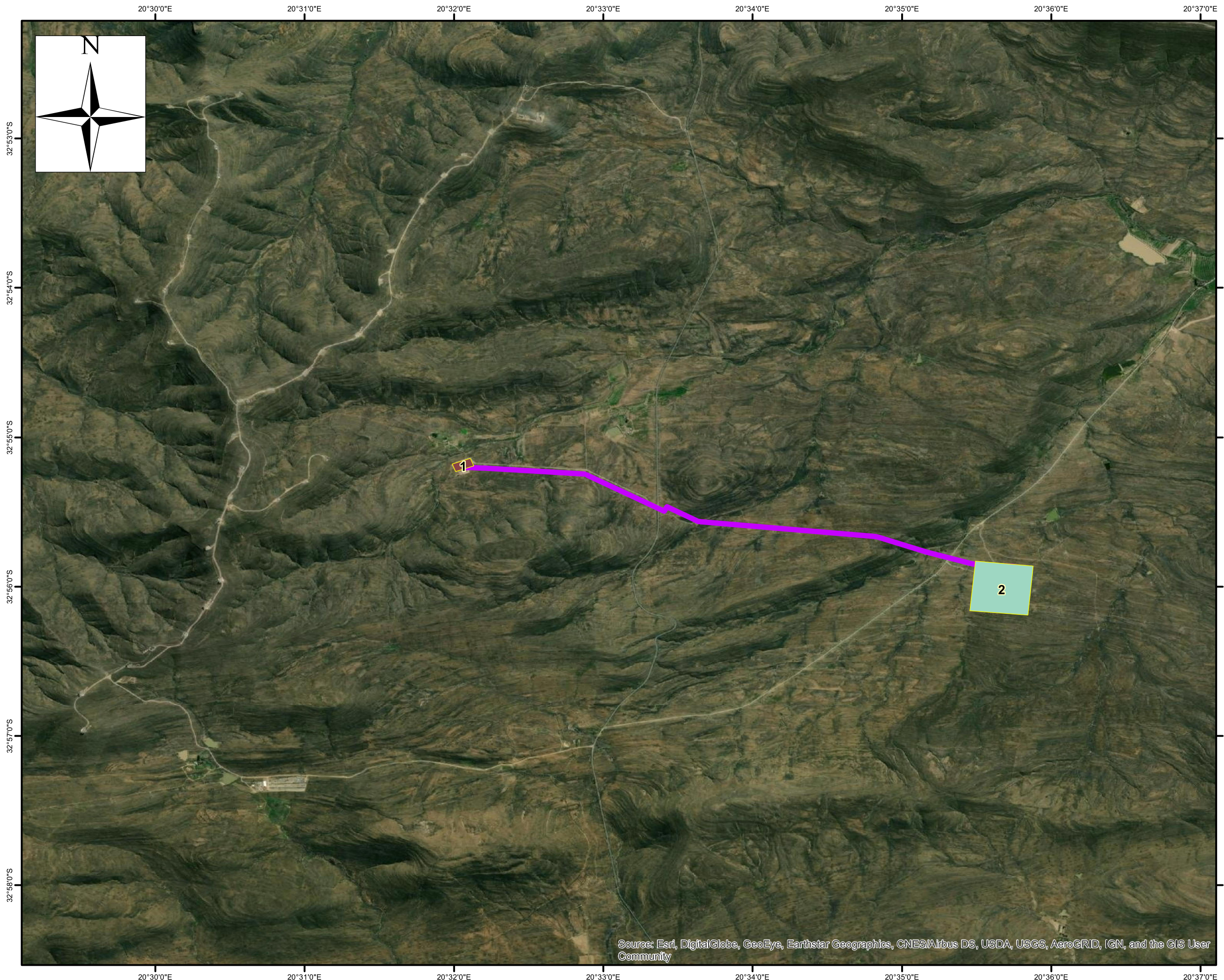
PO Box 794
Hilton 3245
Tel: (033) 343 6789
Fax: (033) 343 6788



Legend

Substations

- (1) Bon Esprange Substation
- (2) Komsberg Substation
- Bon Esprange to Komsberg Powerline



Map No.: 04	Scale (A3): 1:45 765
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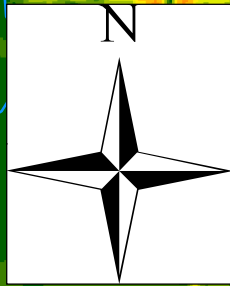
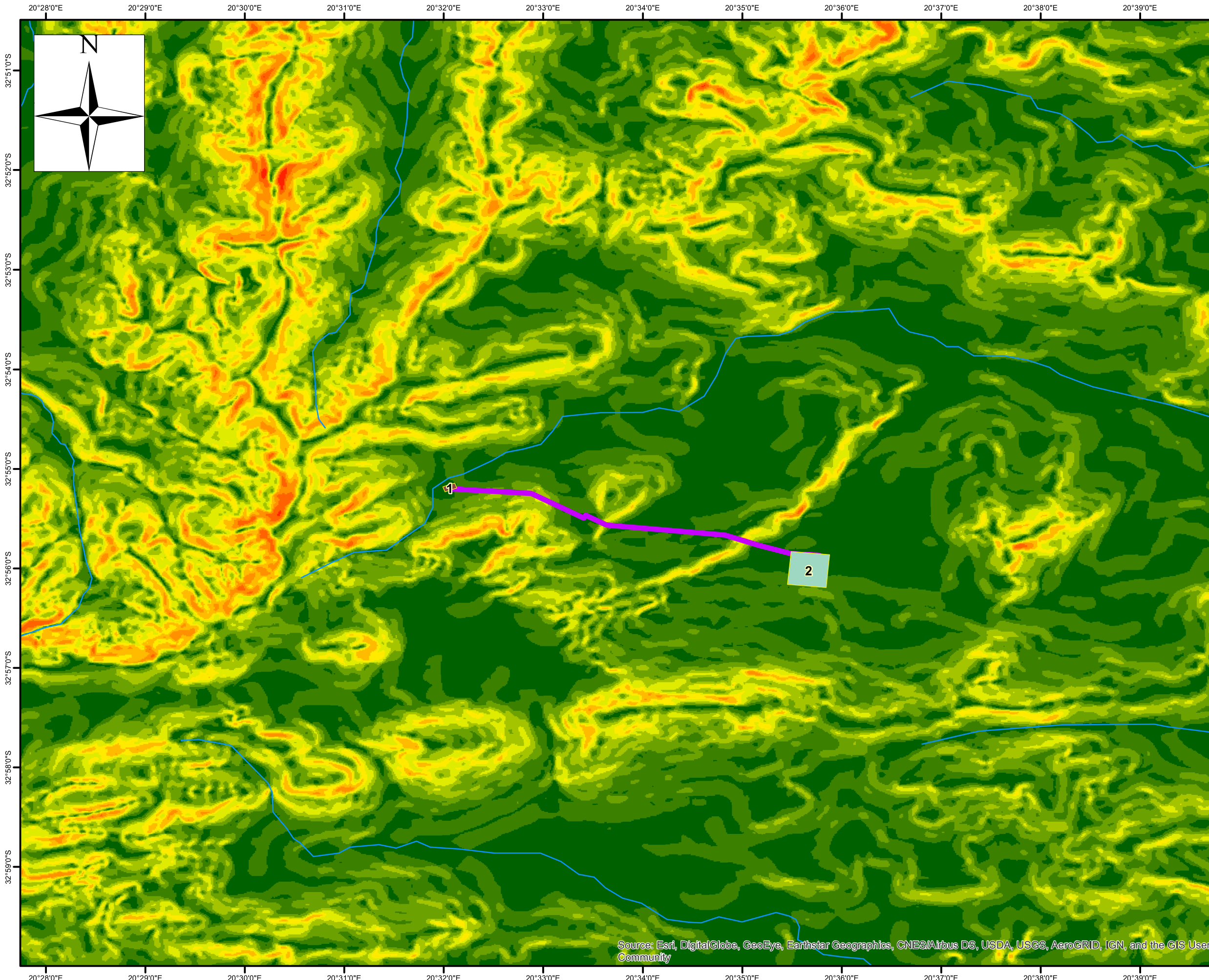
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Designed and detailed under the controls established by our quality management system that meet the requirements of ISO 9001:2000 which has been independently certified by DEKRA Certification under certificate number 90906882.

KAREEBOSCH 132KV POWERLINE GEOTECHNICAL DESKTOP STUDY: SLOPE MAP (MAP 6): BON ESPIRANGE SUBSTATION TO KOMSBERG SUBSTATION [APPLICANT: RED ROCKET SOUTH AFRICA (PTY) LTD]

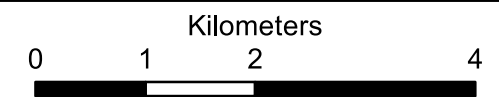


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Legend

- Perennial_Watercourses
- Substations**
- (1) Bon Espirange Substation
- (2) Komsberg Substation
- Bon Espirange to Komsberg Powerline
- dem_slope.tif**
- Slope (%)**
- ≤2.3
- ≤5.5
- ≤9.2
- ≤13.1
- ≤17.2
- ≤21.6
- ≤26.2
- ≤31.5
- ≤38.1
- ≤58.6



Map No.: 06
Scale (A3): 1:68 800

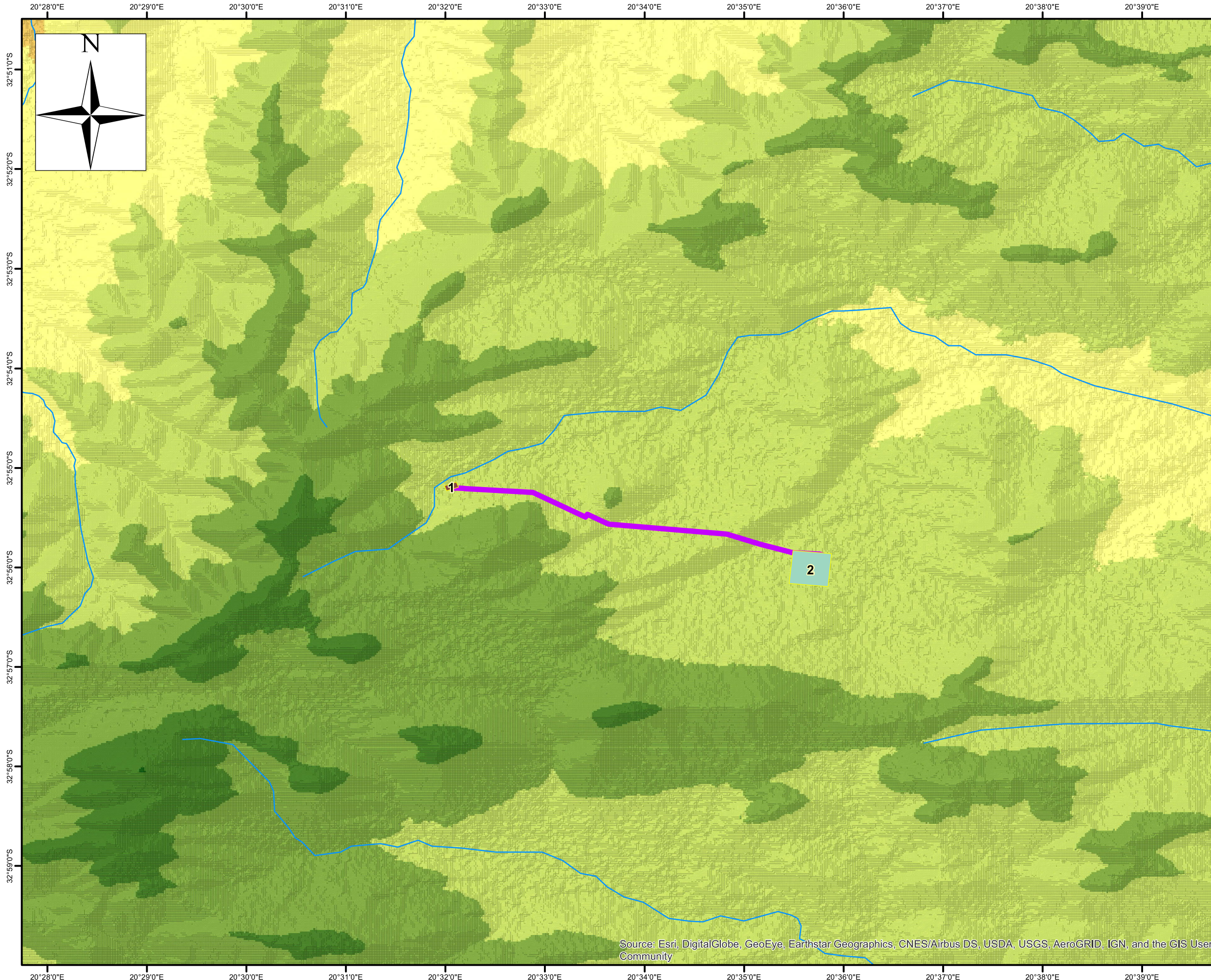
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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KAREEBOSCH 132KV POWERLINE GEOTECHNICAL DESKTOP STUDY: ELEVATION MAP (MAP 8): BON ESPIRANGE SUBSTATION TO KOMSBERG SUBSTATION [APPLICANT: RED ROCKET SOUTH AFRICA (PTY) LTD]

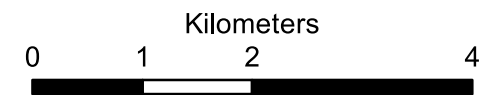


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Fax: (033) 343 6788



Legend

- Perennial_Watercourses
- Substations**
- (1) Bon Esprange Substation
- (2) Komsberg Substation
- Bon Esprange to Komsberg Powerline
- Elevation**
- 368 - 380
- 380 - 542
- 542 - 704
- 704 - 866
- 866 - 1 028
- 1 028 - 1 191
- 1 191 - 1 353
- 1 353 - 1 515
- 1 515 - 1 677



Map No.: 08	Scale (A3): 1:68 800
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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**KAREEBOSCH 132KV POWERLINE GEOTECHNICAL DESKTOP STUDY:
GEOLOGY MAP (MAP 10): BON ESPIRANGE SUBSTATION TO KOMSBERG SUBSTATION [APPLICANT: RED ROCKET SOUTH AFRICA (PTY) LTD]**



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Legend

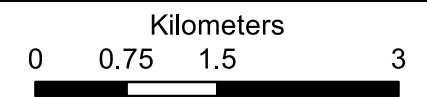
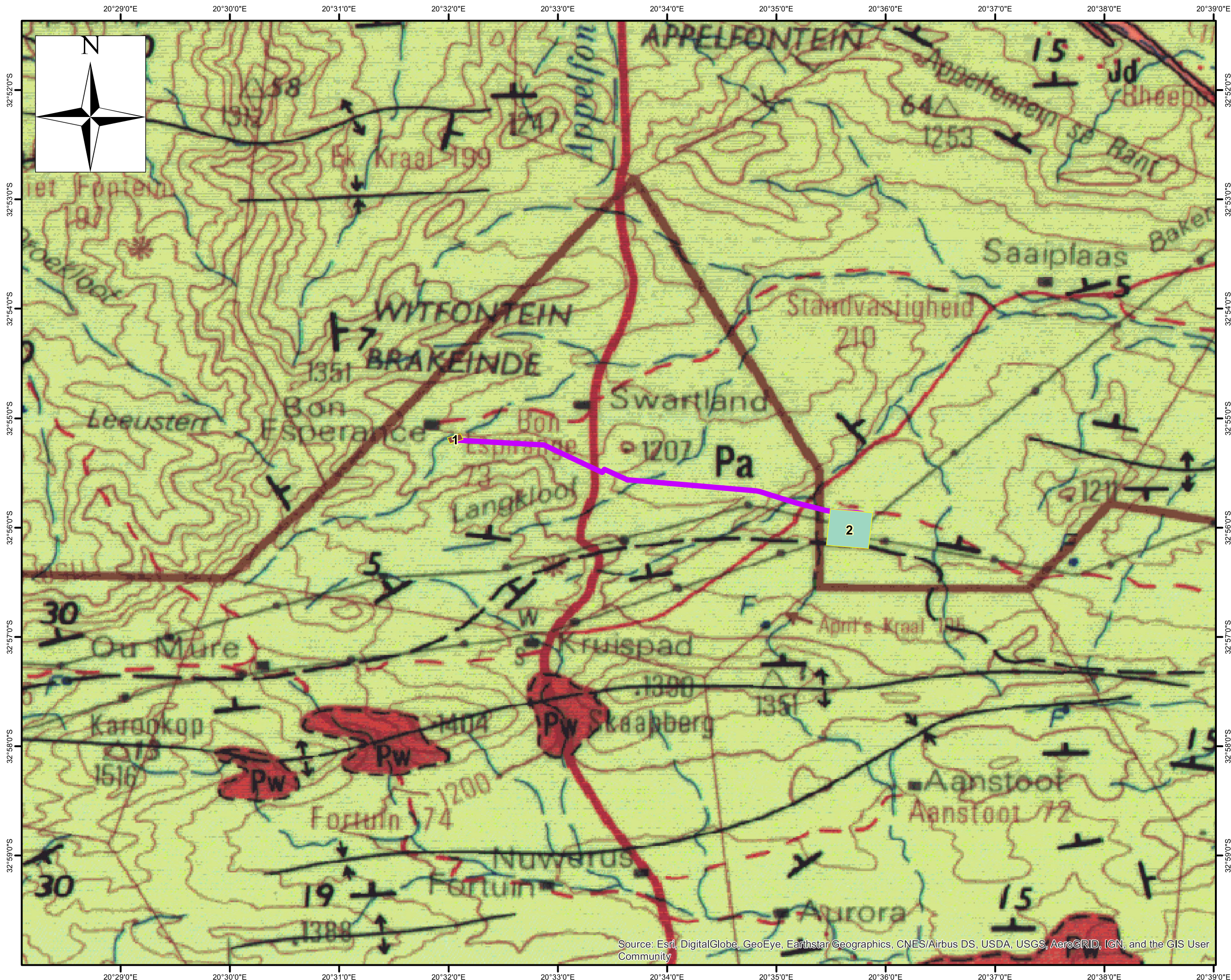
Substations

- (1) Bon Espirange Substation
- (2) Komsberg Substation
- Bon Espirange to Komsberg Powerline

Geology Map Legend:

Pa - Mudstone, siltstone, sandstone, thin cherty beds (lowermost red mudstone)

Pko - Sandstone, Siltstone and Shale



Map No.: 10	Scale (A3): 1:62 500
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Designed and detailed under the controls established by our quality management system that meet the requirements of ISO 9001:2000 which has been independently certified by DEKRA Certification under certificate number 90906882.

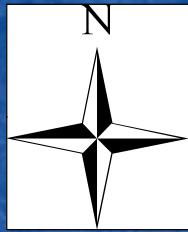
**KAREEBOSCH 132KV POWERLINE GEOTECHNICAL DESKTOP STUDY:
GEOHYDROLOGICAL MAP (MAP 12): BON ESPIRANGE SUBSTATION TO KOMSBERG SUBSTATION
[APPLICANT - RED ROCKET SOUTH AFRICA (PTY) LTD]**



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20°28'0"E 20°29'0"E 20°30'0"E 20°31'0"E 20°32'0"E 20°33'0"E 20°34'0"E 20°35'0"E 20°36'0"E 20°37'0"E 20°38'0"E



32°52'0"S

32°53'0"S

32°54'0"S

32°55'0"S

32°56'0"S

32°57'0"S

32°58'0"S

32°59'0"S

32°52'0"S

32°53'0"S

32°54'0"S

32°55'0"S

32°56'0"S

32°57'0"S

32°58'0"S

32°59'0"S

b2




Fractured 0.1 - 0.5 l/s

1

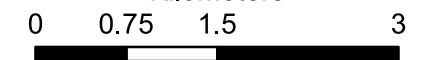
2

Legend

Substations

-  (1) Bon Esprange Substation
-  (2) Komsberg Substation
-  Bon Esprange to Komsberg Powerline

Kilometers



Map No.:
12

Scale (A3):
1:62 500

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Designed and detailed under the controls established by our quality management system that meet the requirements of ISO 9001:2000 which has been independently certified by DEKRA Certification under certificate number 90906882.

20°28'0"E 20°29'0"E 20°30'0"E 20°31'0"E 20°32'0"E 20°33'0"E 20°34'0"E 20°35'0"E 20°36'0"E 20°37'0"E 20°38'0"E

Appendix B: WSP's Impact Assessment Methodology

A
B
C
D
E

Negative		Positive	
Very Low		Very Low	
Low		Low	
Moderate		Moderate	
High		High	
Very High		Very High	

4-15 E
16-30 F
31-60 G
61-80
81-100

The numerical values are tabulated below:

Criteria	Number of Points to Score				
	Score 1	Score 2	Score 3	Score 4	Score 5
Impact Magnitude (M)	Very low	Low	Medium	High	Very high
Impact Extent (E)	Site only	Local	Regional	National	International
Impact Reversibility (R)	Reversible		Recoverable		Irreversible
Impact Duration (D)	Immediate	Short Term	Medium term	Long term	Permanent
Probability of Occurrence (P)	Improbable	Low	Medium	High	Definite

Based on impact significance criteria determined by DEAT, 1998					
CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low	Low	Medium	High	Very high
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probably	Definite
ENVIRONMENTAL SIGNIFICANCE = (MAGNITUDE + EXTENT + REVERSIBILITY + DURATION) x PROBABILITY					
TOTAL SCORE	4 to 15	16 to 30	31 to 60	61 to 80	81 to 100
ENVIRONMENTAL SIGNIFICANCE RATING	Very low	Low	Moderate	High	Very High

Project Name Proposed Development of the 132kV Kareebosch Powerline
Impact Assessment Geotechnical

CONSTRUCTION

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation						
						(M+)	E+	R+	D)x	P=	S	Rating	(M+)	E+	R+	D)x	P=	S	Rating
Impact 1:	Subsoil Removal	Increase Soil Erosion	Construction	Negative	Moderate	3	1	3	3	5	50	N3	2	1	1	2	2	12	N1
Significance						N3 - Moderate							N1 - Very Low						

OPERATIONAL

Impact number	Receptor	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation						
						(M+)	E+	R+	D)x	P=	S	Rating	(M+)	E+	R+	D)x	P=	S	Rating
Impact 1:	Subsoil Removal	Increase Soil Erosion	Operational	Negative	Moderate	1	1	3	4	3	27	N2	1	1	1	4	2	14	N1
Significance						N2 - Low							N1 - Very Low						

DECOMMISSIONING

Impact number	Receptor	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation						
						(M+)	E+	R+	D)x	P=	S	Rating	(M+)	E+	R+	D)x	P=	S	Rating
Impact 1:	Subsoil Removal	Increase Soil Erosion	Decommissioning	Negative	Moderate	4	1	3	2	4	40	N3	2	1	1	2	2	12	N1
Significance						N3 - Moderate							N1 - Very Low						

CUMULATIVE

Impact number	Receptor	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation						
						(M+)	E+	R+	D)x	P=	S	Rating	(M+)	E+	R+	D)x	P=	S	Rating
Impact 1:	Subsoil Removal	Increase Soil Erosion	Cumulative	Negative	Moderate	3	1	3	4	5	55	N3	1	1	1	4	2	14	N1
Significance						N3 - Moderate							N1 - Very Low						

Appendix C: Specialist's CV



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

PROPOSED DEVELOPMENT OF THE 132kV KAREEBOSCH POWERLINE

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at <https://www.environment.gov.za/documents/forms>.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:

Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:

Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	JG Afrika (Pty) Ltd		
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	1	Percentage Procurement recognition
Specialist name:	Khuthadzo Bulala		
Specialist Qualifications:	BSc Hons Geology		
Professional affiliation/registration:	Cand Sci Nat		
Physical address:	06 Pin Oak Avenue, Hilton, Pietermaritzburg		
Postal address:	06 Pin Oak Avenue, Hilton, Pietermaritzburg		
Postal code:	3245	Cell:	
Telephone:	033 343 6700	Fax:	033 343 6701
E-mail:	bulalak@jgafrika.com		

2. DECLARATION BY THE SPECIALIST

I, Khuthadzo Bulala, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.



Signature of the Specialist

JG Afrika (Pty) Ltd

Name of Company:

01/09/2021

Date

Details of Specialist, Declaration and Undertaking Under Oath

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, _____ Khuthadzo Bulala _____, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.



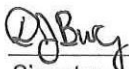
Signature of the Specialist

JG Afrika (Pty) Ltd

Name of Company

01/09/2021

Date



Signature of the Commissioner of Oaths

COMMISSIONER OF OATHS
DAWN JANET BURGIN
9/1/8/2 (R/O) KZN (PIETERMARITZBURG)
6 PIN OAK AVENUE, HILTON

01/09/2021

Date

KHUTHADZO BULALA



Profession	Engineering Geologist
Position in Firm	Engineering Geologist
Area of Specialisation	Geotechnical Engineering, Engineering Geology
Qualifications	BSc (Hons) (Geology) Cand. Sci. Nat.
Years of Experience	5.5 Years
Years with Firm	5 years

SUMMARY OF EXPERIENCE

Khuthadzo is currently an Engineering Geologist based in the Pietermaritzburg office. She was originally employed by the Lesotho Highlands Development Authority (LHDA) as a young professional to work with JG Afrika on site, working on the geotechnical investigation for Phase II of the Lesotho Highlands Water Project. At the completion of the contract with LHDA, she joined JG Afrika as a permanent employee. Through her time on site she gained valuable experience in site investigations, from assisting with the supervision of the contractor, profiling and logging, analysis of in-situ and laboratory testing, and reporting. Since returning to the office she has been involved with a number of small to large scaled geotechnical investigation in KwaZulu-Natal.

PROFESSIONAL REGISTRATIONS & INSTITUTE MEMBERSHIPS

Cand.Sci.Nat. - Registered as a Candidate Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP) - Registration No 116482

EDUCATION

2007 – Matric – Mbilwi Secondary School
2011 – BSc (Geology) – University of Johannesburg, Johannesburg
2013 – BSc (Hons) (Geology) – University of Limpopo, Polokwane

SPECIFIC EXPERIENCE

JG Afrika (Pty) Ltd (Previously Jeffares & Green (Pty) Ltd)

2017 -
Position – Engineering Geologist

Mfulamuni Access Road – Project manager responsible for the field geotechnical investigation and reporting for the re-gravelling of four access roads in Mahlaba, Pomeroy. Client: ZVK Holdings (Pty) Ltd

Zwelisha Moyeni Waste-Water Treatment Works – Project manager responsible for the filed investigation and the report writing for the proposed WWTW extensions. Client: JG Afrika (Pty) Ltd Water Division

Hammersdale Waste-Water Treatment Works – Engineering Geologist responsible for the additional field investigation and the report writing for the proposed WWTW extensions. Client: eThekweni Municipality: Water and Sanitation Division

Emanzini Estate Geohydrology Assessment – Engineering Geologist responsible for the hydrocensus for the soak away pits feasibility at the proposed Mt Verde Estate. Client: Emanzini Private Reserve

Mt Verde Geohydrology Assessment – Engineering Geologist responsible for the hydrocensus and percolation tests for the soak away pits feasibility at the proposed Mt Verde Estate. Client: Venture Partners

Ntabamhlophe Tank – Project manager responsible for the field investigation and the report writing for the proposed tank. Client: JG Afrika Water Division

Kenhardt Solar PV Plant – Project manager responsible for the field investigation and the report writing for the proposed solar PV plant. Client: Scatec Solar South Africa.

Heidelberg Cemetery – Project manager and field geologist responsible for the investigation and the report writing for the proposed existing Heidelberg cemetery extension. Client: Marang Environmental and Associates (Pty) Ltd

Cornubia Fills – Engineering geologist responsible for the field investigation and the report writing for the proposed cut and fill assessments for the Cornubia Boulevard Transit Mall development. Client: Smec

Kokstad CRU Contamination Study – Engineering geologist responsible for the contamination study for the Kokstad community residential units' phase 2 study. Client: Ingcweti Ace Technology

Mandalathi Hall – Project manager responsible for the geotechnical investigation and report writing for the proposed Mandalathi hall. Client: Dartingo Consulting Engineers (Pty) Ltd

Umgungundlovu Landfill Site – Engineering geologist responsible for the percussion drilling site supervision and the hydrocensus for the geohydrological assessment. Client: Séché South Africa

Gluckstaadt Water Supply Scheme – Engineering geologist responsible for the geotechnical investigation and report writing for bulk and reticulation pipeline routes, pump stations, reservoirs and water treatment works for the proposed development. Client: SiVEST

Agribusiness Development Agency Rabbitries – Project manager responsible for the geological investigation and report writing for five ADA Rabbitries development. Client: JG Afrika Agricultural Department. Client: JG Afrika Agricultural Department

Alfred Duma Cemetery – Engineering geologist responsible for writing the site selection desktop study report for eight sites in the Alfred Duma Municipality. Client: Ziphelele Planning and Environmental Consultancy

Eskom Radio Towers – Engineering geologist responsible for the field investigation and report writing for nine Eskom Towers in Eastern Cape. Client: Eskom

220 Murray Road – Project manager, responsible for managing field investigation (conducted by Muhammad Osman) and writing an infill geotechnical investigation report for a multi-story development in Hayfields. Client: Green Door Environmental

Giba Industrial Development – Engineering geologist responsible for the field investigation for Giba Industrial Development and assisted with the Geotech report. Client: Sultex Holdings (Pty) Ltd

Rietfontein Dam Geotechnical Investigation – Project manager, field geologist involved with the geotechnical investigations and reporting for the founding conditions and material investigation of the proposed Rietfontein Dam in Eastern Cape. Client: Calvus Properties Client:

Kirkwood Borrow pit and Retaining Walls – Engineering geologist involved in the geotechnical investigation and reporting for the borrow pit and retaining wall foundations of the proposed R336 Road Upgrade. Client: Royal Haskoning

83 West Street – Project manager, field geologist involved with the geotechnical investigations and report writing. Client: Private Developer

Eastwood Pedestrian Bridge – Project manager, field geologist involved with the geotechnical investigations and report writing. Client: High End Construction

N3 Quarry Logging – Geologist involved in the geotechnical logging of quarries between Durban and Pietermaritzburg, Client: South African National Road Agency Limited

N2 Kangela to Pongola Borrow Pit Geotechnical Investigations – Assisted with the geotechnical report, Client: South African National Road Agency Limited

N2 Kangela to Pongola Road Widening Geotechnical Investigations – Assisted with the geotechnical report, Client: South African National Road Agency Limited

Gowrie Farm Stand No.295 Geotechnical Investigations – Project manager, field geologist involved with the geotechnical investigations and report writing. Client: Delute Construction

45 Richard Carte Road – Geologist involved with the field investigations for the refurbishment of the warehouse. Client: T2 Design Lab

Darvil Sludge Dam – Geologist involved with the field investigations for the founding conditions, slope stability and materials investigations. Client: Umgeni Water

Acaciavale Landfill Closure Geotechnical Investigation- Geologist involved in the field investigation and the report writing. Client: Alfred Duma Municipality

Ntaba Ridge Plots Geotechnical Investigation- Project manager, field geologist involved in the geotechnical investigation at several plots. Involved in trial pitting, profiling and sampling and report writing.

Umhlatuze Cemetery Feasibility Study- Geologist involved in the project management, desktop study report, field investigation and the report writing. Client: uMhlatuze Municipality

Harry Gwala Irrigation Scheme – Client: Department of Rural Development and Land Reform
■ Responsible for augering, soil profiling and sampling of the soils

- Assisted with the GIS for the various proposed sites
- Report writing for the project

Intaba Ridge Estate Landswop for Cemetery Geotech Investigation- Field geologist and involved in trial pitting, profiling and sampling.

Horseshoe, Mkhuphula and Nkungumathe Irrigation Scheme – Geologist involved in soil survey and report writing. Client: Department of Rural Development and Land Reform.

Geotechnical Investigations for Maryvale Housing- field geologist and involved in a shallow geotechnical investigation for a housing development. Client: eThekweni Municipality

Manzamyama River Bridge Geotechnical Investigations – field geologist, involved in a deep geotechnical investigation for a new bridge. Client: Naidu Consulting

Cedara Petrol Filling Station Geotechnical Investigations- field geologist, involved in geotechnical investigations for various structures – Involved in trial pitting, profiling, percolation testing and sampling. Client: Barco Petroleum

Lesotho Highlands Water Project: Phase II (165m high Polihali Dam and Transfer Tunnel)- Assisted with the geotechnical reports for the Polihali Dam Polihali Transfer Tunnel. Client: Lesotho Highlands Development Authority

Mount Edge Combe Underpass Geotechnical Investigations- Involved in geotechnical logging and sampling. Client: Naidu Consulting

Lesotho Highlands Water Project: Phase II: Site geologist for one year based at the Polihali Dam and Transfer Tunnel site in Lesotho. Assisted with the geotechnical rotary core logging of boreholes drilled across the various proposed dam and transfer tunnel design components. Gained valuable experience in logging of the Lesotho Basalts. Client: Lesotho Highlands Development Authority

Lesotho Highlands Development Authority

Mar 2016-Aug 2016

Position – Engineering Geologist Intern

Lesotho Highlands Water Project: Phase II Engineering Geologist Intern at the Polihali Dam Site in Lesotho, seconded to JG Afrika, assisting supervising the LHDA Contract 4016, Polihali Dam and Transfer Tunnel Geotechnical Investigation. Assisted with borehole logging, and supervision and administration of the rotary core drilling investigation. Client: Lesotho Highlands Development Authority

While seconded to JG Afrika:

Albert Falls: - field geologist involved in geotechnical investigations for a pipeline. Involved in trial pitting, profiling and sampling. Client: BVI Consulting Engineers

Umlazi Housing- field geologist involved in geotechnical investigations for various structures. Involved in trial pitting, profiling and sampling. Client: BVI Consulting Engineers

South Coast National Route R61- Assistant field geologist involved in geotechnical investigations. Client: South African National Road Agency Limited

PERSONAL DETAILS

Nationality – South African

Date of Birth – 1990-03-30

Domicile – Thohoyandou, South Africa

Languages

English – Good

English - Very Good

Tshivenda - Very Good

Sesotho - Good

Setswana - Good

Sepedi - Good



UNIVERSITY OF LIMPOPO

WE,
THE UNDERSIGNED,
HEREBY CERTIFY THAT

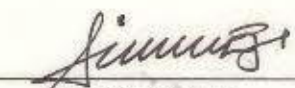
BULALA KHUTHADZO
(201213617)

HAS BEEN AWARDED THE DEGREE

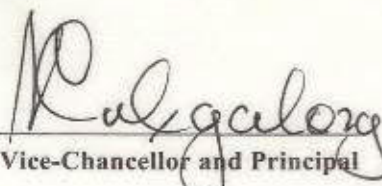
Bachelor of Science Honours

AT A CONGREGATION OF THE UNIVERSITY




Executive Dean


Registrar


Vice-Chancellor and Principal

24 MAY 2013

UNIVERSITY OF LIMPOPO: FORMERLY THE MEDICAL UNIVERSITY OF SOUTHERN AFRICA
AND THE UNIVERSITY OF THE NORTH

T 34342



herewith certifies that

Khuthadzo Bulala

Registration Number: 116482

is a registered scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
in the following field(s) of practice (Schedule 1 of the Act)

Geological Science (Candidate Natural Scientist)

Effective **9 November 2016**

Expires **31 March 2022**



A handwritten signature in black ink, appearing to read 'Botha', is written over a horizontal line.

Chairperson

A handwritten signature in black ink, appearing to read 'M. Priddy', is written over a horizontal line.

Chief Executive Officer

